



## Legend

1.  $X_{k-1}$  = velocity, theta and w
2.  $X_k$  current state **Black arrow wraps around for [1]**
3.  $Y_k$  sensor values =  $I * X_k + \text{gaussian noises}$
4.  $U_{k-1}$  = Torque and steering angles.
5.  $\hat{X}_{k-1}$  = previous state of EKF  $X_k$  function of EKF
6.  $X_k$  = current state
7.  $\hat{X}'_k$  = current state of EKF  $X_k$  function of EKF

## Black Box Legend.

- Simulation Vehicle Model = CARLA + gaussian noise
- Simulation Controller = generating inputs e.g sin wave for steering angle and ramp input for torque
- Simulation Sensor Model =  $(V, \theta, w) * I$  plus gaussian noise
- Correction EKF sensor Model = Corrects current state value using noisy sensors
- Prediction EKF Vehicle Model = predicts value based on previous state estimate and input U